CTD data from ring nets used to collect copepods on the RV/Ira, June-Oct 2017 and May 2019

Website: https://www.bco-dmo.org/dataset/818213
Data Type: Cruise Results
Version: 1
Version Date: 2020-07-09

Project
» Collaborative Research: Navigating through space in turbulence tubes: Copepod responses to Burgers' vortex (Burgers_Vortex_Copepods)

Contributors	Affiliation	Role
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Abstract
This dataset reports CTD data from ring nets used to collect copepods on the RV/Ira, June-Oct 2017 and May 2019. Copepods were used in laboratory vortex swimming studies.

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Coverage

Spatial Extent: **N**:43.9033 **E**:-69.5008 **S**:43.7532 **W**:-69.5777
Temporal Extent: 2017-06-02 - 2019-05-31

Dataset Description

This dataset reports CTD data from ring nets used to collect copepods on the RV/Ira, June-Oct 2017 and May 2019. Copepods were used in laboratory vortex swimming studies.

Methods & Sampling

Vertical Net Hauls were made with a 0.75 cm diameter ring net and 333 um mesh size. A solid cod end was used to maintain high-quality live animals. Animals were sorted in the lab.

Data from CTD/rosette was extracted using SBEDataprocessing-win32.

Data Processing Description

BCO-DMO Processing Notes:
- processed original Excel file "Fields 1537579 - Samples Sent.xlsx", submitted 2020-07-07

- pre-processing in Excel: "Shipping dates" sheet:
- made the lat/lon formats consistent. Assumed they were degree-decimal minute
- added conventional header with dataset name, PI name, version date
- renamed columns to conform with BCO-DMO naming conventions (removed units and special characters)
- concatenated 5 sheets (cruise data) from submitted file
- reformatted date from yyyymmdd to yyyy-mm-dd
- reduced precision of data: Temperature/Salinity/Density from 4 to 2; O2_pcent_sat from 5 to 2; PAR from exponential notation to 5 decimal places
- joined lat and lon to concatenated ctd sheets
- final table saved as .csv file

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Data Files

File
CTD.csv (Comma Separated Values (.csv), 139.44 KB) MD5:59ec597eb138d66e724ca549ea1b4f12 Primary data file for dataset ID 818213

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Parameters

Parameter	Description	Units
Station	Station identifier	unitless
lat	Latitude; north is positive	decimal degrees
lon	Longitude; east is positive	decimal degrees
Date	Cast date	unitless
Depth	Depth	meters
Temperature	Temperature	degrees Celsius
Salinity	Salinity	Practical Salinity Units (PSU)
Density	Density	kilograms/cubic meter (kg/m^3)
PAR	Irradiance	microEinsteins/meter^2/second (uE/m^2/sec)
Fluorescence	Fluorescence	milligrams/cubic meter (mg/m3)
Turbidity	Turbidity	Nephelometric Turbidity Units (NTU)
Beam	Beam attenuation	per meter (1/m)
O2_umol	Dissolved oxygen concentration	micromol/kilogram (umol/Kg)
O2_pct_sat	Oxygen percent saturation	unitless

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Instruments

Dataset-specific Instrument Name	Sea-Bird Electronics (SBE) CTD
Generic Instrument Name	CTD Sea-Bird
Generic Instrument Description	Conductivity, Temperature, Depth (CTD) sensor package from SeaBird Electronics, no specific unit identified. This instrument designation is used when specific make and model are not known. See also other SeaBird instruments listed under CTD. More information from Sea-Bird Electronics.

Dataset-specific Instrument Name	Biospherical scalar PAR sensor
Generic Instrument Name	Photosynthetically Available Radiation Sensor
Generic Instrument Description	A PAR sensor measures photosynthetically available (or active) radiation. The sensor measures photon flux density (photons per second per square meter) within the visible wavelength range (typically 400 to 700 nanometers). PAR gives an indication of the total energy available to plants for photosynthesis. This instrument name is used when specific type, make and model are not known.

Dataset-specific Instrument Name	
Generic Instrument Name	Ring Net
Dataset-specific Description	A ring net with a 0.75 cm diameter, 333 um mesh size, and a solid cod-end was used to capture live copepods.
Generic Instrument Description	A Ring Net is a generic plankton net, made by attaching a net of any mesh size to a metal ring of any diameter. There are 1 meter, .75 meter, .25 meter and .5 meter nets that are used regularly. The most common zooplankton ring net is 1 meter in diameter and of mesh size .333mm, also known as a 'meter net' (see Meter Net).

Dataset-specific Instrument Name	WET Labs C-Star transmissometer
Generic Instrument Name	WET Labs {Sea-Bird WETLabs} C-Star transmissometer
Generic Instrument Description	The C-Star transmissometer has a novel monolithic housing with a highly intgrated opto-electronic design to provide a low cost, compact solution for underwater measurements of beam transmittance. The C-Star is capable of free space measurements or flow-through sampling when used with a pump and optical flow tubes. The sensor can be used in profiling, moored, or underway applications. Available with a 6000 m depth rating. More information on Sea-Bird website: https://www.seabird.com/c-star-transmissometer/product?id=60762467717

Dataset-specific Instrument Name	ECO-FLNTU fluorometer
Generic Instrument Name	WETLabs ECO-FLNTU
Generic Instrument Description	The ECO FLNTU is a dual-wavelength, single-angle sensor for simultaneously determining both chlorophyll fluorescence and turbidity.

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Project Information

Collaborative Research: Navigating through space in turbulence tubes: Copepod responses to Burgers' vortex (Burgers_Vortex_Copepods)

Website: http://www.nsf.gov/awardsearch/showAward?AWD_ID=1537284

Coverage: Coast of Maine

Copepods are ubiquitous animals in marine environments and play a critically-important function in the food web of the world's oceans. The ability of a copepod to sense fluid motion provides an advantage for critical survival tactics such as finding food, finding mates, and avoiding predators. This project will examine the capability of copepods to detect turbulent flow. A turbulent-like flow will be mimicked in a laboratory aquarium as a small vortex (i.e., swirling motion like a tornado), and copepod swimming behavior will be observed in and around the vortex. The goal is to understand the variations in the sensory ecology of three species of copepods with three representative sensor arrays to better explain their temporal and spatial distribution in the ocean in response to turbulence conditions. The project also has a strong education and outreach plan. It will provide interdisciplinary training for graduate and undergraduate students in fields such as engineering, biology, and computational sciences. Further, research results will provide context for planned outreach efforts to educate the general public at local high schools and aquariums.

The project will deconstruct the turbulence-copepod interaction by performing detailed kinematics analysis of swimming in three species of copepods in and around a laboratory realization of a Burgers' vortex that mimics in situ turbulent vortices in the dissipation range of scales. The goal is to test the hypothesis that the copepods Acartia tonsa, Temora longicornis, and Calanus finmarchicus detect hydrodynamic cues related to vortices in turbulent flows and actively respond via changes in swimming kinematics. Using a custom designed and calibrated apparatus, a turbulent-like vortex will be created in the laboratory. By holding the turbulent vortex stable in space, cameras will be focused on a small region of the feature to record the animal behavior relative to well-quantified flow characteristics. The approach has the advantage of eliminating the time-varying and stochastic nature of turbulent flows that make such mechanistic understanding so challenging to achieve. Hypotheses will address questions about the influence of swimming style, setal array architecture, and the interaction of chemical and hydrodynamical cues on the turbulence-copepod interaction. Specifically, the investigators will examine how copepod species with different sensory structures and swimming orientation respond to a stable well-defined laboratory stimulus to determine how copepods exploit the shape and orientation of turbulent features. The species of copepods chosen for this work provide a range of sensory architectures, swimming orientations, sizes, and mate tracking abilities.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1537579

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